

Applicant(s): Cornelis L. G. Ham et al.
Serial No.: 10/791,024
Filed: March 2, 2004
For: METHOD OF AND DEVICE FOR THE COMPENSATION OF VARIATIONS OF THE MAIN MAGNETIC FIELD DURING MAGNETIC RESONANCE IMAGING
Art Unit: 2859
Examiner: Fetzner, Tiffany A.

Attorney Docket No.: PHN17333B

IN THE CLAIMS:

The following listing of the pending claims, as amended hereby, is as follows; the listing supercedes all prior claims listings.

1. (Currently Amended) A method of determining a compensation signal for the compensation of a temporally varying field strength of the main magnetic field of a main magnet of a magnetic resonance imaging system that device which also includes at least one gradient field coil for generating a gradient magnetic field to adjust the main magnetic field with a compensation signal, the method comprising:

determining at least one quantity which is characteristic (characteristic quantity) of the temperature-dependent magnetic property properties of a magnetizable material included as part of the magnetic resonance imaging system, device and which interacts with the main magnetic field fields of such system device, the device and its immediate vicinity being substantially steady, and

generating providing the compensation signal₂ on the basis of said characteristic quantity₂ and providing the compensation signal to the gradient field coil for adjusting the temporally varying field strength.

2. (Currently Amended) A method as claimed in claim 1₂ wherein anthe electric signal applied to said at least one gradient magnetic field coil is determined as one characteristic quantity.

3. (Currently Amended) A method as claimed in claim 1₂ wherein a the temperature of the magnetizable material is determined as one characteristic quantity.

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4. (Currently Amended) A method as claimed in claim 1, wherein the main magnet includes a main magnetic field coil having a resistance which is not negligibly small with respect to power dissipation, and wherein a further quantity which is characteristic of the temperature-dependent magnetic properties of the magnetizable material is determined from an amount of the electric power dissipated in the main magnetic field coil.

5. (Currently Amended) A method as claimed in claim 1, wherein the compensation signal is provided based ~~on the basis of~~ a predetermined functional relationship between the temperature-dependent magnetic properties of the magnetizable material and each relevant characteristic quantity.

6. (Currently Amended) A method as claimed in claim 5, wherein the ~~predetermined relevant~~ functional relationship is recorded in a look-up table, including an ~~the~~ input parameter, that of which is a representation of each characteristic quantity, and an ~~whereas its~~ output parameter is a representation of the compensation signal.

7. (Currently Amended) A method as claimed in claim 1, wherein the device includes an auxiliary magnetic field coil for the compensation of the field strength of the main magnetic field, and for ~~and further comprising~~ compensating the main magnetic field by generating an auxiliary magnetic field ~~by means of the auxiliary magnetic field coil~~ in conformity with the provided compensation signal.

8. (Cancelled)

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9. (Currently Amended) A method as claimed in claim 1 wherein the magnetic resonance imaging system ~~device~~ includes high-frequency (RF) oscillator means for energizing at least one high-frequency (RF) coil, ~~and further comprising adapting during operation the frequency of the RF oscillator means~~ in conformity with the ~~provided~~ compensation signal.

10. (Currently Amended) A method as claimed in claim 9, wherein the frequency of the RF oscillator means is adapted prior to the application of one or more gradient magnetic field signals.

11. (Currently Amended) A method as claimed claim 1, wherein the magnetic resonance imaging system ~~device~~ includes ~~processor-controlled~~ processing means for the processing of an information signal acquired under the influence of the main magnetic field, which ~~and further comprising controlling the processing means~~ operating in conformity with the ~~provided~~ compensation signal ~~in order to~~ provide a compensated information signal.

12. (Currently Amended) A method as claimed claim 1, wherein variations of the field strength of the main magnetic field are determined and compensated for, if necessary, one or more times during an image data acquisition period.

13. (Currently Amended) A method as claimed in claim 1, further including ~~comprising~~ measuring variations of the field strength of the main magnetic field ~~which are~~ caused by one or more ~~of: further quantities, including~~ external magnetic fields, atmospheric pressure and mechanical vibrations, and wherein the step of providing includes generating ~~further comprises providing~~ the compensation signal based on ~~from~~ a relevant functional relationship indicative of ~~which represents~~ the effect of the one or more further quantities on the main magnetic field.

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14. (Currently Amended) A device for magnetic resonance imaging comprising:
a receiving space for accommodating an object to be imaged,
a main magnet for generating a main magnetic field in the receiving space,
at least one gradient field coil,
at least one high-frequency (RF) coil,
means for determining at least one quantity which is characteristic of the temperature-dependent magnetic properties of a magnetizable material which is included as part of the magnetic resonance device, and which interacts with the magnetic fields of the device,
control means for energizing and controlling the main magnet, the gradient field coil and the RF coil, and
processing means ~~which are actively coupled to the energizing and control means in order to determine a compensation signal to compensate for the compensation of a temporally varying field strength of the main magnetic field in accord with~~ wherein the processing means are arranged to carry out the method claimed in claim 1.

15. (Cancelled)

16. (Cancelled)

17. (Cancelled)

18. (Cancelled)

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19. (Currently Amended) A method as claimed in claim 7, wherein the main magnet includes a main magnetic field coil with~~having~~ a resistance which is not negligibly small with respect to power dissipation, and compensating ~~further comprising compensating~~ the main magnetic field by controlling the electrical energizing of the main magnetic field coil based on ~~in conformity with the provided~~ compensation signal.

20. (Currently Amended) A method as claimed in claim 7, wherein the device includes high-frequency (RF) oscillator means for energizing at least one high-frequency (RF) coil at a frequency that conforms, ~~and further comprising adapting during operation the frequency of the RF oscillator means in conformity with the provided~~ compensation signal.